المعادلات الواردة بالباب الأول

(1) $N_{2(g)} + 3H_{2(g)} \xrightarrow[Fe]{500^\circ C/200\ atm} 2NH_{3(g)}$

(2) $2SO_{2(g)} + O_{2(g)} \xrightarrow[450^\circ C]{V_2O_5} 2SO_{3(g)}$

(3) $SO_{3(s)} + H_2O_{(l)} \longrightarrow H_2SO_{4(aq)}$

(4) $2H_2O_{2(l)} \xrightarrow{MnO_2} 2H_2O_{(l)} + O_{2(g)}$

(5) $FeCO_{3(s)} \xrightarrow{\Delta} FeO_{(s)} + CO_{2(g)}$

(6) $2FeO_{(s)} + \frac{1}{2} O_{2(g)} \xrightarrow{\Delta} Fe_2O_{3(s)}$

(7) $2Fe_2O_3.3H_2O_{(s)} \xrightarrow{\Delta} 2Fe_2O_{3(s)} + 3H_2O_{(v)}$

(8) $S_{(s)} + O_{2(g)} \xrightarrow{\Delta} SO_{2(g)}$

(9) $4P_{(s)} + 5O_{2(g)} \xrightarrow{\Delta} 2P_2O_{5(g)}$

(10) $C_{(s)} + O_{2(g)} \xrightarrow{\Delta} CO_{2(g)}$

(11) $CO_{2(g)} + C_{(s)} \xrightarrow{\Delta} 2CO_{(g)}$

(12) $3CO_{(g)} + Fe_2O_{3(s)} \xrightarrow{\Delta} 2Fe_{(s)} + 3CO_{2(g)}$

(13) $2CH_{4(g)} + CO_{2(g)} + H_2O_{(v)} \xrightarrow{\Delta} 3CO_{(g)} + 5H_{2(g)}$

(14) $2Fe_2O_{3(s)} + 3CO_{(g)} + 3H_{2(g)} \xrightarrow{\Delta} 4Fe_{(s)} + 3CO_{2(g)} + 3H_2O_{(v)}$

(15) $3Fe_{(s)} + 2O_2 \xrightarrow{\Delta} Fe_3O_{4(s)}$

(16) $3Fe_{(s)} + 4H_2O_{(v)} \xrightarrow{500^\circ C} Fe_3O_{4(s)} + 4H_{2(g)}$

(17) $2Fe_{(s)} + 3Cl_{2(g)} \xrightarrow{\Delta} 2FeCl_{3(s)}$

(18) $Fe_{(s)} + S_{(s)} \xrightarrow{\Delta} FeS_{(s)}$

(19) $Fe_{(s)} + H_2SO_{4(aq)} \xrightarrow{dil} FeSO_{4(aq)} + H_{2(g)}$

(20) $Fe_{(s)} + 2HCl_{(aq)} \xrightarrow{dil} FeCl_{2(aq)} + H_{2(g)}$

$$(21)\ 3Fe_{(s)} + 8H_2SO_{4(l)} \xrightarrow[\text{conc}]{\Delta} FeSO_{4(aq)} + Fe_2(SO_4)_{3(aq)} + 4SO_{2(g)} + 8H_2O_{(v)}$$

$$(22)\ (COO)_2Fe_{(s)} \xrightarrow[\text{بمعزل عن الهواء}]{\Delta} FeO_{(s)} + CO_{2(g)} + CO_{(g)}$$

$$(23)\ Fe_2O_{3(s)} + H_{2(g)} \xrightarrow{400^\circ : 700^\circ C} 2FeO_{(s)} + H_2O_{(v)}$$

$$(24)\ Fe_3O_{4(s)} + H_{2(g)} \xrightarrow{400^\circ : 700^\circ C} 3FeO_{(s)} + H_2O_{(v)}$$

$$(25)\ 4FeO_{(s)} + O_{2(g)} \xrightarrow{\Delta} 2Fe_2O_{3(s)}$$

$$(26)\ FeO_{(s)} + H_2SO_{4(aq)} \xrightarrow{dil} FeSO_{4(aq)} + H_2O_{(l)}$$

$$(27)\ FeCl_{3(aq)} + 3NH_4OH_{(aq)} \longrightarrow Fe(OH)_{3(s)} + 3NH_4Cl_{(aq)}$$

$$(28)\ 2Fe(OH)_{3(s)} \xrightarrow{>200^\circ C} Fe_2O_{3(s)} + 3H_2O_{(v)}$$

$$(29)\ 2FeSO_{4(s)} \xrightarrow{\Delta} Fe_2O_{3(s)} + SO_{2(g)} + SO_{3(g)}$$

$$(30)\ Fe_2O_{3(s)} + 3H_2SO_{4(aq)} \xrightarrow[\text{conc}]{\Delta} Fe_2(SO_4)_{3(aq)} + 3H_2O_{(v)}$$

$$(31)\ 3Fe_2O_{3(s)} + CO_{(g)} \xrightarrow{230^\circ : 300^\circ C} 2Fe_3O_{4(s)} + CO_{2(g)}$$

$$(32)\ Fe_3O_{4(s)} + 4H_2SO_{4(l)} \xrightarrow[\text{conc}]{\Delta} FeSO_{4(aq)} + Fe_2(SO_4)_{3(aq)} + 4H_2O_{(v)}$$

$$(33)\ 2Fe_3O_{4(s)} + \frac{1}{2}O_{2(g)} \xrightarrow{\Delta} 3Fe_2O_{3(s)}$$

$$(34)\ FeSO_{4(aq)} + 2NaOH_{(aq)} \longrightarrow Na_2SO_{4(aq)} + Fe(OH)_{2(s)}$$

$$(35)\ FeO_{(s)} + H_{2(g)} \xrightarrow{\Delta} Fe_{(s)} + H_2O_{(v)}$$

$$(36)\ FeO_{(s)} + 2HCl_{(aq)} \xrightarrow{dil} FeCl_{2(aq)} + H_2O_{(l)}$$

المعادلات الواردة بالباب الثانى

(1) $Na_2CO_{3(s)} + 2HCl_{(aq)} \longrightarrow 2NaCl_{(aq)} + H_2O_{(l)} + CO_{2(g)}$

(2) $CO_{2(g)} + Ca(OH)_{2(aq)} \xrightarrow{S.T} CaCO_{3(s)} + H_2O_{(l)}$

(3) $Na_2CO_{3(aq)} + MgSO_{4(aq)} \longrightarrow Na_2SO_{4(aq)} + MgCO_{3(s)}$

(4) $MgCO_{3(s)} + 2HCl_{(aq)} \longrightarrow MgCl_{2(aq)} + H_2O_{(l)} + CO_{2(g)}$

(5) $NaHCO_{3(s)} + HCl_{(aq)} \longrightarrow NaCl_{(aq)} + H_2O_{(l)} + CO_{2(g)}$

(6) $2NaHCO_{3(aq)} + MgSO_{4(aq)} \longrightarrow Na_2SO_{4(aq)} + Mg(HCO_3)_{2(aq)}$

(7) $Mg(HCO_3)_{2(aq)} \xrightarrow{\Delta} MgCO_{3(s)} + H_2O_{(l)} + CO_{2(g)}$

(8) $Na_2SO_{3(s)} + 2HCl_{(aq)} \longrightarrow 2NaCl_{(aq)} + H_2O_{(l)} + SO_{2(g)}$

(9) $K_2Cr_2O_{7(aq)} + 3SO_{2(g)} + H_2SO_{4(aq)} \longrightarrow K_2SO_{4(aq)} + Cr_2(SO_4)_{3(aq)} + H_2O_{(l)}$

(10) $Na_2SO_{3(aq)} + 2AgNO_{3(aq)} \longrightarrow Ag_2SO_{3(s)} + 2NaNO_{3(aq)}$

(11) $Na_2S_{(s)} + 2HCl_{(aq)} \longrightarrow 2NaCl_{(aq)} + H_2S_{(g)}$

(12) $(CH_3COO)_2Pb_{(aq)} + H_2S_{(g)} \longrightarrow 2CH_3COOH_{(aq)} + PbS_{(s)}$

(13) $Na_2S_{(aq)} + 2AgNO_{3(aq)} \longrightarrow 2NaNO_{3(aq)} + Ag_2S_{(s)}$

(14) $Na_2S_2O_{3(s)} + 2HCl_{(aq)} \longrightarrow 2NaCl_{(aq)} + H_2O_{(l)} + SO_{2(g)} + S_{(s)}$

(15) $2Na_2S_2O_{3(aq)} + I_{2(aq)} \longrightarrow Na_2S_4O_{6(aq)} + 2NaI_{(aq)}$

(16) $NaNO_{2(s)} + HCl_{(aq)} \longrightarrow NaCl_{(aq)} + HNO_{2(aq)}$

(17) $3HNO_{2(aq)} \longrightarrow HNO_{3(aq)} + H_2O_{(l)} + 2NO_{(g)}$

(18) $2NO_{(g)} + O_{2(g)} \longrightarrow 2NO_{2(g)}$

(19) $5NaNO_{2(aq)} + 2KMnO_{4(aq)} + 3H_2SO_{4(aq)} \longrightarrow$

$5NaNO_{3(aq)} + K_2SO_{4(aq)} + 2MnSO_{4(aq)} + 3H_2O_{(l)}$

(20) $2NaCl_{(s)} + H_2SO_{4(l)} \xrightarrow[\Delta]{conc} Na_2SO_{4(aq)} + 2HCl_{(g)}$

(21) $HCl_{(g)} + NH_{3(g)} \longrightarrow NH_4Cl_{(s)}$

(22) $NaCl_{(aq)} + AgNO_{3(aq)} \longrightarrow NaNO_{3(aq)} + AgCl_{(s)}$

(23) $2NaBr_{(s)} + H_2SO_{4(l)} \xrightarrow[\Delta]{conc} Na_2SO_{4(aq)} + 2HBr_{(g)}$

(24) $2HBr_{(g)} + H_2SO_{4(l)} \xrightarrow{conc} 2H_2O_{(l)} + SO_{2(g)} + Br_{2(v)}$

(25) $NaBr_{(aq)} + AgNO_{3(aq)} \longrightarrow NaNO_{3(aq)} + AgBr_{(s)}$

(26) $2KI_{(s)} + H_2SO_{4(l)} \xrightarrow[\Delta]{conc} K_2SO_{4(aq)} + 2HI_{(g)}$

(27) $2HI_{(s)} + H_2SO_{4(l)} \xrightarrow{conc} 2H_2O_{(l)} + SO_{2(g)} + I_{2(V)}$

(28) $NaI_{(aq)} + AgNO_{3(aq)} \longrightarrow NaNO_{3(aq)} + AgI_{(s)}$

(29) $2NaNO_{3(s)} + H_2SO_{4(l)} \xrightarrow[\Delta]{conc} Na_2SO_{4(aq)} + 2HNO_{3(l)}$

(30) $4HNO_{3(l)} \xrightarrow{\Delta} 2H_2O_{(l)} + 4NO_{2(g)} + O_{2(g)}$

(31) $4HNO_{3(l)} + Cu_{(s)} \xrightarrow[\Delta]{conc} Cu(NO_3)_{2(aq)} + 2H_2O_{(l)} + 2NO_{2(g)}$

(32) $2NaNO_{3(aq)} + 6FeSO_{4(aq)} + 4H_2SO_{4(l)} \xrightarrow{conc}$

$3Fe_2(SO_4)_{3(aq)} + Na_2SO_{4(aq)} + 4H_2O_{(l)} + 2NO_{(g)}$

(33) $FeSO_{4(aq)} + NO_{(g)} \longrightarrow FeSO_4.NO_{(s)}$

(34) $2Na_3PO_{4(aq)} + 3BaCl_{2(aq)} \longrightarrow Ba_3(PO_4)_{2(s)} + 6NaCl_{(aq)}$

(35) $Na_3PO_{4(aq)} + 3AgNO_{3(aq)} \longrightarrow 3NaNO_{3(aq)} + Ag_3PO_{4(s)}$

(36) $Na_2SO_{4(aq)} + BaCl_{2(aq)} \longrightarrow 2NaCl_{(aq)} + BaSO_{4(s)}$

(37) $Na_2SO_{4(aq)} + (CH_3COO)_2Pb_{(aq)} \longrightarrow 2CH_3COONa_{(aq)} + PbSO_{4(s)}$

(38) $CuSO_{4(aq)} + H_2S_{(g)} \longrightarrow H_2SO_{4(aq)} + CuS_{(s)}$

(39) $Al_2(SO_4)_{3(aq)} + 6NH_4OH_{(aq)} \longrightarrow 3(NH_4)_2SO_{4(aq)} + 2Al(OH)_{3(s)}$

(40) $Al_2(SO_4)_{3(aq)} + 6NaOH_{(aq)} \longrightarrow 3Na_2SO_{4(aq)} + 2Al(OH)_{3(s)}$

(41) $Al(OH)_{3(s)} + NaOH_{(aq)} \longrightarrow NaAlO_{2(aq)} + 2H_2O_{(l)}$

(42) $FeSO_{4(aq)} + 2NH_4OH_{(aq)} \longrightarrow (NH_4)_2SO_{4(aq)} + Fe(OH)_{2(s)}$

(43) $FeSO_{4(aq)} + 2NaOH_{(aq)} \longrightarrow Na_2SO_{4(aq)} + Fe(OH)_{2(s)}$

(44) $FeCl_{3(aq)} + 3NH_4OH_{(aq)} \longrightarrow 3NH_4Cl_{(aq)} + Fe(OH)_{3(s)}$

(45) $FeCl_{3(aq)} + 3NaOH_{(aq)} \longrightarrow 3NaCl_{(aq)} + Fe(OH)_{3(s)}$

(46) $CaCl_{2(aq)} + (NH_4)_2CO_{3(aq)} \longrightarrow 2NH_4Cl_{(aq)} + CaCO_{3(s)}$

(47) $CaCO_{3(s)} + H_2O_{(l)} + CO_{2(g)} \longrightarrow Ca(HCO_3)_{2(aq)}$

(48) $CaCl_{2(aq)} + H_2SO_{4(aq)} \longrightarrow 2HCl_{(aq)} + CaSO_{4(s)}$

(49) $NaOH_{(aq)} + HCl_{(aq)} \longrightarrow NaCl_{(aq)} + H_2O_{(l)}$

المعادلات الواردة بالباب الخامس

(1) $NH_4Cl_{(aq)} + AgCNO_{(aq)} \longrightarrow AgCl_{(s)} + NH_4CNO_{(aq)}$

(2) $NH_4CNO_{(aq)} \xrightarrow{\Delta} H_2N - CO - NH_{2(s)}$

(3) $C + 2CuO_{(s)} \xrightarrow{\Delta} 2Cu_{(s)} + CO_{2(g)}$

(4) $2H + CuO_{(s)} \xrightarrow{\Delta} Cu_{(s)} + H_2O_{(v)}$

(5) $CH_3COONa_{(s)} + NaOH_{(s)} \xrightarrow[\Delta]{CaO} CH_{4(g)} + Na_2CO_{3(s)}$

(6) $CH_{4(g)} + 2O_{2(g)} \xrightarrow{\Delta} CO_{2(g)} + 2H_2O_{(v)} + \text{Energy}$ احتراق.

(7) $CH_{4(g)} + Cl_{2(g)} \xrightarrow{UV} CH_3Cl_{(g)} + HCl_{(g)}$

(8) $CH_3Cl_{(g)} + Cl_{2(g)} \xrightarrow{UV} CH_2Cl_{2(g)} + HCl_{(g)}$

(9) $CH_2Cl_{2(g)} + Cl_{2(g)} \xrightarrow{UV} CHCl_{3(g)} + HCl_{(g)}$

(10) $CHCl_{3(g)} + Cl_{2(g)} \xrightarrow{UV} CCl_{4(l)} + HCl_{(g)}$

(11) $C_8H_{18(l)} \xrightarrow[cat]{\Delta/P} C_4H_{8(g)} + C_4H_{10(g)}$

(12) $CH_{4(g)} \xrightarrow[\text{no air}]{1000°C} 2H_{2(g)} + C_{(s)}$

(13) $CH_{4(g)} + H_2O_{(v)} \xrightarrow[cat]{725°C} CO_{(g)} + 3H_{2(g)}$ الغاز المائي.

(14) $C_2H_5OH_{(l)} + H_2SO_{4(aq)} \xrightarrow[80°C]{conc} C_2H_5.HSO_{4(aq)} + H_2O_{(l)}$

(15) $C_2H_5.HSO_{4(aq)} \xrightarrow{180°C} C_2H_{4(g)} + H_2SO_{4(aq)}$

(16) $C_2H_{4(g)} + 3O_{2(g)} \xrightarrow{\Delta} 2CO_{2(g)} + 2H_2O_{(v)} + \text{Energy}$

(17) $C_2H_{4(g)} + H_{2(g)} \xrightarrow[150°C - 300°C]{Pt \text{ or } Ni} C_2H_{6(g)}$

(18) $H_2C = CH_{2(g)} + Br_{2(l)} \xrightarrow{CCl_4} Br - CH_2 - CH_2 - Br_{(l)}$

(19) $H_2C=CH_{2(g)} + HBr_{(g)} \longrightarrow CH_3-CH_2-Br_{(g)}$

(20) $C_2H_5HSO_{4(l)} + H_2O_{(l)} \xrightarrow{110^\circ C} C_2H_5OH_{(aq)} + H_2SO_{4(aq)}$

(21) $C_2H_{4(g)} + H_2O_{(l)} \xrightarrow[110^\circ C]{conc\ H_2SO_4} C_2H_5OH_{(l)}$

(22) $\begin{matrix} H \\ H \end{matrix} \!>\! C=C \!<\! \begin{matrix} H \\ H \end{matrix} + H_2O + (O) \xrightarrow[alkaline\ medium]{KMnO_4} \begin{matrix} CH_2-OH \\ | \\ CH_2-OH \end{matrix}$

(23) $nCH_2=CH_2 \longrightarrow +CH_2-CH_2+_n$

(24) $\underset{\diagdown\ \diagup \atop Ca}{C\equiv C_{(s)}} + 2H_2O_{(l)} \longrightarrow H-C\equiv C-H_{(g)} + Ca(OH)_{2(aq)}$

(25) $2CH_{4(g)} \xrightarrow[fast\ cooling]{1500^\circ C} C_2H_{2(g)} + 3H_{2(g)}$

(26) $2C_2H_{2(g)} + 3O_{2(g)} \xrightarrow{\Delta} 2CO_{2(g)} + 2H_2O_{(v)} + 2C_{(s)}$

(27) $2C_2H_{2(g)} + 5O_{2(g)} \xrightarrow{\Delta} 4CO_{2(g)} + 2H_2O_{(v)} + 300^\circ C$

(28) $H-C\equiv C-H_{(g)} + H_{2(g)} \xrightarrow{Ni} H_2C=CH_{2(g)} \xrightarrow{+H_2} C_2H_{6(g)}$

(29) $C_2H_{2(g)} + Br_2 \xrightarrow{CCl_4} BrCH=CHBr_{(l)} \xrightarrow{+Br_2} Br-\overset{Br}{\overset{|}{CH}}-\overset{Br}{\overset{|}{CH}}-Br_{(l)}$

(30) $C_2H_{2(g)} + HBr_{(g)} \longrightarrow H_2C=CHBr_{(g)} \xrightarrow{HBr} CH_3-CHBr_{2(l)}$

(31) $H-C\equiv C-H_{(g)} + H_2O_{(g)} \xrightarrow[HgSO_4\ /60^\circ C]{H_2SO_4\ (40\%)} \left[H-\overset{H}{\overset{|}{C}}=\overset{OH}{\overset{|}{C}}-H \right] \xrightarrow{\text{إعادة ترتيب}} CH_3-CHO_{(l)}$

(32) $CH_3-CHO_{(l)} \xrightarrow[acidified\ KMnO_4]{[O]} CH_3COOH_{(l)}$

(33) $CH_3CHO_{(l)} \xrightarrow[reduction]{2H} CH_3CH_2OH_{(l)}$

(34) $CH_3-(CH_2)_4-CH_{3(l)} \xrightarrow[Pt]{\Delta}$ (benzene ring)$_{(l)} + 4H_{2(g)}$

(35) $3C_2H_{2(g)} \xrightarrow[Ni\ tube]{red\ hot} C_6H_{6(l)}$

(36) $C_6H_5OH_{(v)} + Zn_{(s)} \xrightarrow[\text{reduction}]{\Delta} C_6H_{6(l)} + ZnO_{(s)}$

(37) $C_6H_5COONa_{(s)} + NaOH_{(s)} \xrightarrow[\Delta]{CaO} C_6H_{6(l)} + Na_2CO_{3(s)}$

(38) $2\,C_6H_5CH_{3(l)} + 2Cl_{2(g)} \xrightarrow{Fe} o\text{-}ClC_6H_4CH_{3(l)} + p\text{-}ClC_6H_4CH_{3(l)} + 2HCl_{(g)}$

(39) $C_6H_5NO_{2(l)} + Cl_{2(g)} \xrightarrow{Fe} m\text{-}ClC_6H_4NO_{2(l)} + HCl_{(g)}$

(40) $C_6H_{6(l)} + 3H_{2(g)} \xrightarrow[\text{cat}]{\Delta/P} C_6H_{12(l)}$

(41) $C_6H_{6(l)} + 3Cl_{2(g)} \xrightarrow{UV} C_6H_6Cl_{6(l)}$

(42) $C_6H_{6(l)} + Cl_{2(g)} \xrightarrow[UV]{FeCl_3} C_6H_5Cl_{(l)} + HCl_{(g)}$

(43) $C_6H_{6(l)} + CH_3Cl_{(g)} \xrightarrow[\Delta]{\text{anhydrous } AlCl_3} C_6H_5CH_{3(l)} + HCl_{(g)}$

(44) $C_6H_{6(l)} + HNO_{3(l)} \xrightarrow[50^\circ C]{\text{conc } H_2SO_4} C_6H_5NO_{2(l)} + H_2O_{(v)}$

(45) $C_6H_5CH_{3(l)} + 3HNO_{3(l)} \xrightarrow[\Delta]{\text{conc } H_2SO_4} CH_3C_6H_2(NO_2)_{3(s)} + 3H_2O_{(v)}$

(46) $C_6H_{6(l)} + H_2SO_{4(l)} \xrightarrow{\text{conc}} C_6H_5SO_3H_{(l)} + H_2O_{(l)}$

(47) $R\text{-}C_6H_4\text{-}SO_3H_{(l)} + NaOH_{(aq)} \longrightarrow R\text{-}C_6H_4\text{-}SO_3^-Na^+_{(aq)} + H_2O_{(l)}$

(48) $C_{12}H_{22}O_{11(s)} + H_2O_{(l)} \xrightarrow{\text{hydrolysis}} C_6H_{12}O_{6(aq)} + C_6H_{12}O_{6(aq)}$

(49) $2C_6H_{12}O_{6(aq)} \xrightarrow[\text{zymase enzyme}]{\text{yeast}} 4C_2H_5OH_{(l)} + 4CO_{2(g)} + \text{Energy}$

(50) منتجات بترولية $\xrightarrow{\text{craking}} C_2H_{4(g)} + H_2O_{(l)} \xrightarrow[110^\circ C]{\text{conc } H_2SO_4} C_2H_5OH_{(v)}$

(51) $CH_3-CH=CH_{2(l)} + H_2O_{(l)} \xrightarrow[110^\circ C]{\text{conc } H_2SO_4} CH_3-\underset{\underset{OH}{|}}{CH}-CH_{3(l)}$

(52) $CH_3-\overset{\overset{CH_3}{|}}{C}=CH-CH_{3(l)} + H_2O_{(l)} \xrightarrow[110^\circ C]{\text{conc } H_2SO_4} CH_3-\underset{\underset{OH}{|}}{\overset{\overset{CH_3}{|}}{C}}-CH_2-CH_{3(l)}$

(53) $C_2H_5Br_{(l)} + KOH_{(aq)} \xrightarrow[\Delta]{\text{مائية}} C_2H_5OH_{(aq)} + KBr_{(aq)}$

(54) $(CH_3)_2CHBr_{(l)} + KOH_{(aq)} \xrightarrow[\Delta]{\text{مائية}} (CH_3)_2CHOH_{(aq)} + KBr_{(aq)}$

(55) $(CH_3)_3CCl_{(l)} + KOH_{(aq)} \xrightarrow[\Delta]{\text{مائية}} (CH_3)_3COH_{(aq)} + KCl_{(aq)}$

(56) $2C_2H_5OH_{(l)} + 2Na_{(s)} \longrightarrow 2C_2H_5ONa_{(l)} + H_{2(g)}$

(57) $C_2H_5ONa_{(l)} + H_2O_{(l)} \longrightarrow C_2H_5OH_{(aq)} + NaOH_{(aq)}$

(58) $CH_3COOH_{(l)} + C_2H_5OH_{(l)} \xrightarrow[H_2SO_4]{\text{conc}} CH_3COOC_2H_{5(aq)} + H_2O_{(l)}$

(59) $C_2H_5OH_{(l)} + HCl_{(l)} \xrightarrow{ZnCl_2} C_2H_5Cl_{(aq)} + H_2O_{(l)}$

(60) $CH_3CH_2OH_{(l)} \xrightarrow[-H_2O]{[O]} CH_3CHO_{(l)} \xrightarrow{[O]} CH_3COOH_{(l)}$

(61) $CH_3-\underset{\underset{OH}{|}}{\overset{\overset{H}{|}}{C}}-CH_{3(l)} \xrightarrow{[O]} CH_3-\overset{\overset{O}{\|}}{C}-CH_{3(l)} + H_2O$

(62) $C_2H_5OH_{(l)} \xrightarrow[180^\circ C]{\text{conc } H_2SO_4} C_2H_{4(g)} + H_2O_{(v)}$

(63) $2C_2H_5OH_{(l)} \xrightarrow[140^\circ C]{\text{conc } H_2SO_4} C_2H_5OC_2H_{5(g)} + H_2O_{(v)}$

(64) $\begin{array}{l} CH_2-OH \\ | \\ CH\ \ -OH \\ | \\ CH_2-OH_{(l)} \end{array} + 3HNO_{3(l)} \xrightarrow[H_2SO_4]{\text{conc}} \begin{array}{l} CH_2-ONO_2 \\ | \\ CH\ \ -ONO_2 \\ | \\ CH_2-ONO_{2(l)} \end{array} + 3H_2O_{(v)}$

(65) $C_6H_5Cl_{(l)} + NaOH_{(aq)} \xrightarrow[300\ atm]{300^\circ C} C_6H_5OH_{(v)} + NaCl_{(aq)}$

(66) $C_6H_5OH_{(l)} + 3HNO_{3(l)} \xrightarrow[H_2SO_4]{\text{conc}} (O_2N)_3C_6H_2OH_{(s)} + 3H_2O_{(l)}$

(67) n a–▨–a + n b–⬭–b ⟶ [▨–⬭]$_n$ + 2n ab

(68) $2CH_3COOH_{(aq)} + Mg_{(s)} \longrightarrow (CH_3COO)_2Mg_{(aq)} + H_{2(g)}$

(69) $CH_3COOH_{(aq)} + NaHCO_{3(s)} \longrightarrow CH_3COONa_{(aq)} + H_2O_{(l)} + CO_{2(g)}$

(70) $CH_3COOH_{(aq)} + NaOH_{(aq)} \longrightarrow CH_3COONa_{(aq)} + H_2O_{(l)}$

(71) $CH_3COOH_{(aq)} + 2H_{2(g)} \xrightarrow[200^\circ C]{CuCrO_4} C_2H_5OH_{(v)} + H_2O_{(v)}$

(72) $2C_6H_5CH_{3(l)} + 3O_{2(g)} \xrightarrow[400^\circ C]{V_2O_5} 2C_6H_5COOH_{(aq)} + 2H_2O_{(v)}$

(73) $C_6H_5COOH_{(l)} + NaOH \longrightarrow C_6H_5COONa_{(aq)} + H_2O_{(l)}$

(74) $C_6H_5COOH_{(l)} + C_2H_5OH \xrightarrow[HCl]{\text{dry}} C_6H_5COOC_2H_{5(aq)} + H_2O_{(l)}$

(75) $-NH_2 + HCH_2COOH \longrightarrow NH_2CH_2COOH$

(76) $CH_3-\overset{\overset{O}{\|}}{C}-OC_2H_{5(l)} + H_2O_{(l)} \xrightarrow{H^+} CH_3COOH_{(aq)} + C_2H_5OH_{(l)}$

(77) $CH_3COOC_2H_{5(l)} + NaOH_{(aq)} \longrightarrow CH_3COONa_{(aq)} + C_2H_5OH_{(l)}$

(78) $C_6H_5COOC_2H_{5(aq)} + NaOH_{(aq)} \longrightarrow C_6H_5COONa_{(aq)} + C_2H_5OH_{(aq)}$

(79) $CH_3COOC_2H_{5(l)} + NH_{3(g)} \longrightarrow CH_3CONH_{2(l)} + C_2H_5OH_{(l)}$

(80) $C_6H_5COOC_2H_{5(l)} + NH_{3(g)} \longrightarrow C_6H_5CONH_{2(l)} + C_2H_5OH_{(l)}$

(81)
$$\begin{array}{l} CH_2-OH \\ | \\ CH\ \ -OH \\ | \\ CH_2-OH \end{array} + \begin{array}{l} HO-\overset{\overset{O}{\|}}{C}-R_1 \\ HO-\overset{\overset{O}{\|}}{C}-R_2 \\ HO-\overset{\overset{O}{\|}}{C}-R_3 \end{array} \longrightarrow \begin{array}{l} CH_2-O-\overset{\overset{O}{\|}}{C}-R_1 \\ | \\ CH\ \ -O-\overset{\overset{O}{\|}}{C}-R_2 \\ | \\ CH_2-O-\overset{\overset{O}{\|}}{C}-R_3 \end{array} + 3H_2O$$

(82)
$$HO-\overset{\overset{O}{\|}}{C}-C_6H_4-\overset{\overset{O}{\|}}{C}-OH_{(l)} + HO-CH_2-CH_2-OH_{(l)}$$
$$\big\downarrow -H_2O$$
$$HO-\overset{\overset{O}{\|}}{C}-C_6H_4-\overset{\overset{O}{\|}}{C}-O-CH_2-CH_2-OH$$

(83)
$$C_6H_4(OH_{(l)})-\overset{\overset{O}{\|}}{C}-\boxed{OH+H}-O-CH_{3(l)} \longrightarrow C_6H_4(OH)-\overset{\overset{O}{\|}}{C}-O-CH_{3(l)} + H_2O_{(l)}$$

(84)
$$C_6H_4(COOH)-O\boxed{H_{(l)}+HO}-\overset{\overset{O}{\|}}{C}-CH_{3(l)} \longrightarrow C_6H_4(COOH)-O-\underset{\underset{O}{\|}}{C}-CH_{3(s)} + H_2O_{(l)}$$

(85)
$$C_6H_4(COOH)-O-\overset{\overset{O}{\|}}{C}-CH_{3(s)} + H_2O_{(l)} \xrightarrow[\text{وسط حامضي}]{H^+} C_6H_4(COOH)(OH)_{(aq)} + CH_3-\overset{\overset{O}{\|}}{C}-OH_{(aq)}$$

(86) $HCOOH_{(l)} + CH_3OH_{(l)} \xrightarrow[H_2SO_4]{conc} HCOOCH_{3(aq)} + H_2O_{(l)}$

(87) $C_6H_5OH + HCHO + C_6H_5OH \longrightarrow HO-C_6H_4-CH_2-C_6H_4-OH + H_2O$

(88) $CH_3-CH=CH_{2(g)} + HBr_{(g)} \longrightarrow CH_3-CHBr-CH_{3(l)}$

(89) $CH_3-CHBr-CH_3 + KOH \xrightarrow[\Delta]{\text{مائی}} CH_3-CHOH-CH_3 + KBr$

(90) $C_6H_5ONa + HCl \longrightarrow C_6H_5OH + NaCl$

(91) $CH_3-CH_2-CH=CH_2 + HBr \longrightarrow CH_3-CH_2-CHBr-CH_3$

(92) $CH_3-CH=CH-CH_3 + HBr \longrightarrow CH_3-CH_2-CHBr-CH_3$

(93) $CH_3-C(CH_3)=C(CH_3)-CH_3 + HBr \longrightarrow CH_3-CH(CH_3)-CBr(CH_3)-CH_3$

(94) $H_2C=C(CH_3)-CH_3 + HBr \longrightarrow CH_3-CBr(CH_3)-CH_3$

(95) $C_6H_5CH_3 + 3Cl_2 \xrightarrow[\Delta]{Fe} CH_3C_6H_2Cl_3 \text{ (2,4,6-Cl)} + 3HCl$

(96) $C_6H_5CH_3 + H_2SO_4 \xrightarrow{conc} CH_3C_6H_4SO_3H \text{ (ortho)} + H_2O$

(97) $2\,C_6H_5Cl + 2HNO_3 \xrightarrow[H_2SO_4]{conc} ClC_6H_4NO_2 \text{ (ortho)} + ClC_6H_4NO_2 \text{ (para)} + 2H_2O$

(98) $CH_3-CH_2-CH_2OH \xrightarrow[180^\circ C]{conc\ H_2SO_4} CH_3-CH=CH_2 + H_2O$

(99) $CH_3-CH=CH_2 + H_2O + [O] \xrightarrow[\text{وسط قلوی}]{KMnO_4} CH_3-CH(OH)-CH(OH)-H$

$$2\,C_6H_5OH + 2Na \longrightarrow 2\,C_6H_5ONa + H_2 \quad (100)$$

$$C_6H_5OH + NaOH \longrightarrow C_6H_5ONa + H_2O \quad (101)$$

(102) $CH_3(CH_2)_2CH_2Br + KOH_{(aq)} \xrightarrow{\Delta} CH_3(CH_2)_2CH_2OH + KBr$

(103) $CH_3-CH_2-CHBr-CH_3 + KOH_{(aq)} \xrightarrow{\Delta} CH_3-CH_2-CHOH-CH_3 + KBr$

(104) $CH_3-C(CH_3)(Br)-CH_3 + KOH_{(aq)} \xrightarrow{\Delta} CH_3-C(CH_3)(OH)-CH_3 + KBr$

(105) $CH_3(CH_2)_2CH_2OH \xrightarrow[-H_2O]{[O]} CH_3(CH_2)_2CHO \xrightarrow{[O]} CH_3(CH_2)_2COOH$

(106) $CH_3-CH_2-CHOH-CH_3 \xrightarrow[-H_2O]{[O]} CH_3-CH_2-\overset{O}{\overset{\|}{C}}-CH_3$

(107) $2CH_3COOH + 2Na \longrightarrow 2CH_3COONa + H_2\uparrow$

(108) $2C_6H_5COOH + 2Na \longrightarrow 2C_6H_5COONa + H_2\uparrow$

(109) $2C_6H_5COOH + Mg \longrightarrow (C_6H_5COO)_2Mg + H_2\uparrow$

(110) $C_6H_5COOH + NaHCO_3 \longrightarrow C_6H_5COONa + H_2O + CO_2$

(111) $CH_3Cl + NaOH_{(aq)} \xrightarrow{\Delta} CH_3OH + NaCl$

(112) $2HCOOH + Ca(OH)_2 \longrightarrow (HCOO)_2Ca + 2H_2O$

(113) $CH_3CH_2COOH + KOH \longrightarrow CH_3CH_2COOK + H_2O$

(114) $C_6H_4(OH)COOH + NaOH \longrightarrow C_6H_4(OH)COONa + H_2O$

(115) $C_6H_5COOH + CH_3OH \xrightarrow[HCl]{dry} C_6H_5COOCH_3 + H_2O$

(116) $C_2H_5COOH + CH_3OH \xrightarrow[H_2SO_4]{conc} C_2H_5COOCH_3 + H_2O$

(117) $\begin{array}{c} COOH \\ | \\ COOH \end{array} + FeO \longrightarrow (COO)_2Fe + H_2O$

(118) $\begin{array}{ccc} H & & H \\ | & & | \\ C & = & C \\ | & & | \\ H & & H \end{array} + \begin{array}{ccc} H & & H \\ | & & | \\ C & = & C \\ | & & | \\ H & & H \end{array} \xrightarrow[\text{حرارة (عوامل مساعدة)}]{\text{ضغط}} \bullet\begin{array}{ccc} H & & H \\ | & & | \\ C & - & C \\ | & & | \\ H & & H \end{array}\bullet + \bullet\begin{array}{ccc} H & & H \\ | & & | \\ C & - & C \\ | & & | \\ H & & H \end{array}\bullet \xrightarrow[\text{ذرات الكربون بروابط تساهمية}]{\text{بارتباط عدد كبير من}} \left[\begin{array}{ccc} H & & H \\ | & & | \\ C & - & C \\ | & & | \\ H & & H \end{array}\right]_n$

(119) $H - \begin{array}{c} H \\ | \\ C \\ | \\ H \end{array} - \begin{array}{c} H \\ | \\ C \\ | \\ CH_3 \end{array} - \begin{array}{c} H \\ | \\ C \\ \\ \\ \end{array} = \begin{array}{c} H \\ | \\ C \\ \\ \\ \end{array} - H + H_2O + [O] \xrightarrow[\text{قلوي}]{KMnO_4} H - \begin{array}{c} H \\ | \\ C \\ | \\ H \end{array} - \begin{array}{c} H \\ | \\ C \\ | \\ CH_3 \end{array} - \begin{array}{c} H \\ | \\ C \\ | \\ OH \end{array} - \begin{array}{c} H \\ | \\ C \\ | \\ OH \end{array} - H$

(120) $C_2H_{6(g)} + Br_{2(l)} \xrightarrow{UV} C_2H_5Br_{(g)} + HBr_{(g)}$

(121) $CH_2 = CH_{2(g)} + HOSO_3H_{(aq)} \xrightarrow{80°C} CH_3CH_2OSO_3H_{(aq)}$